Internet Exchange Point Design

ISP/IXP Workshops

IXP Design

- **Layer 2 Exchange Point**

- **Layer 3 Exchange Point**

- **Transit Exchange Point**
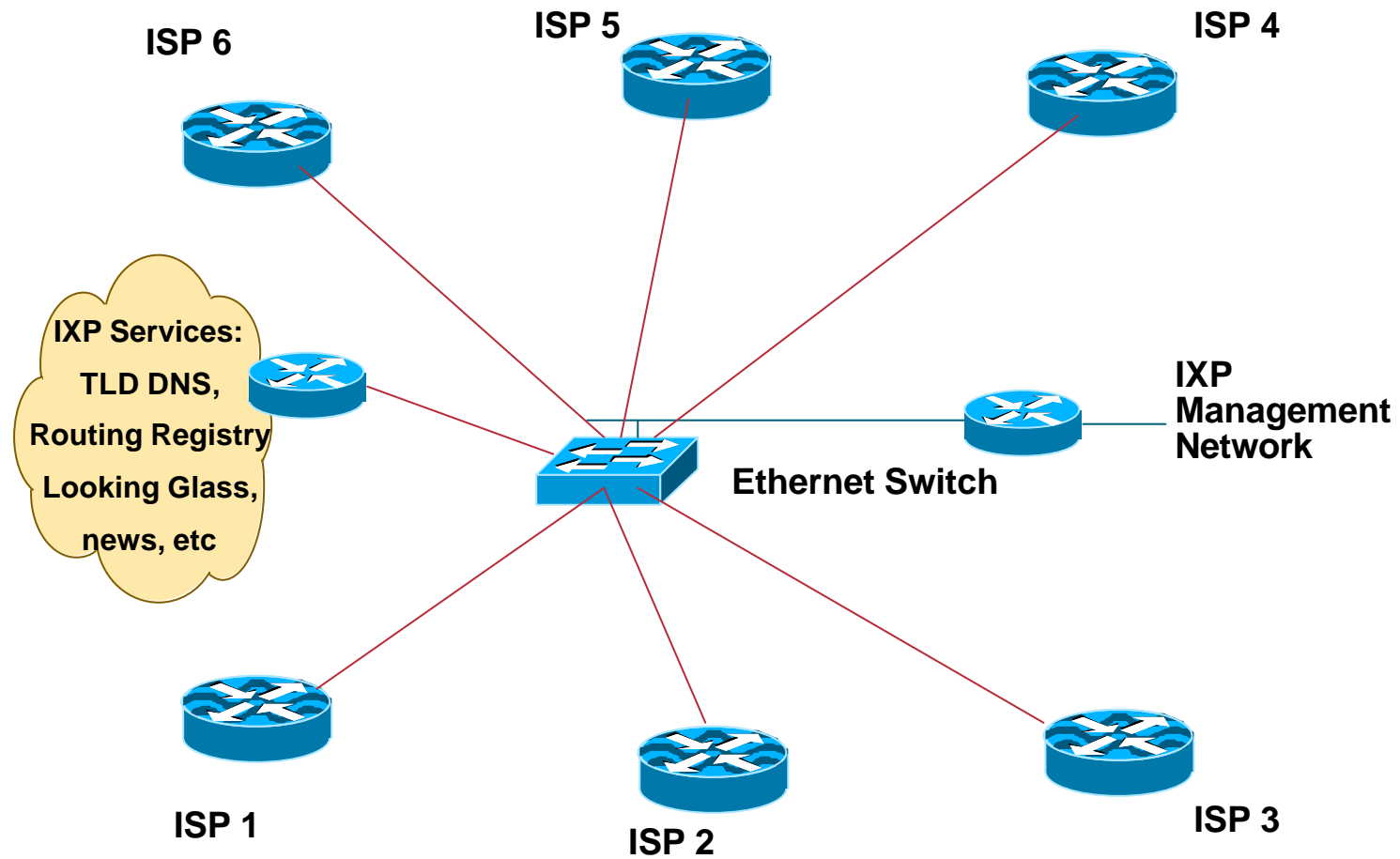
- **Design Considerations**

Internet Exchange Points

- ## Layer 2 exchange point

    ethernet, ATM or Frame Relay switch

- ## Layer 3 exchange point
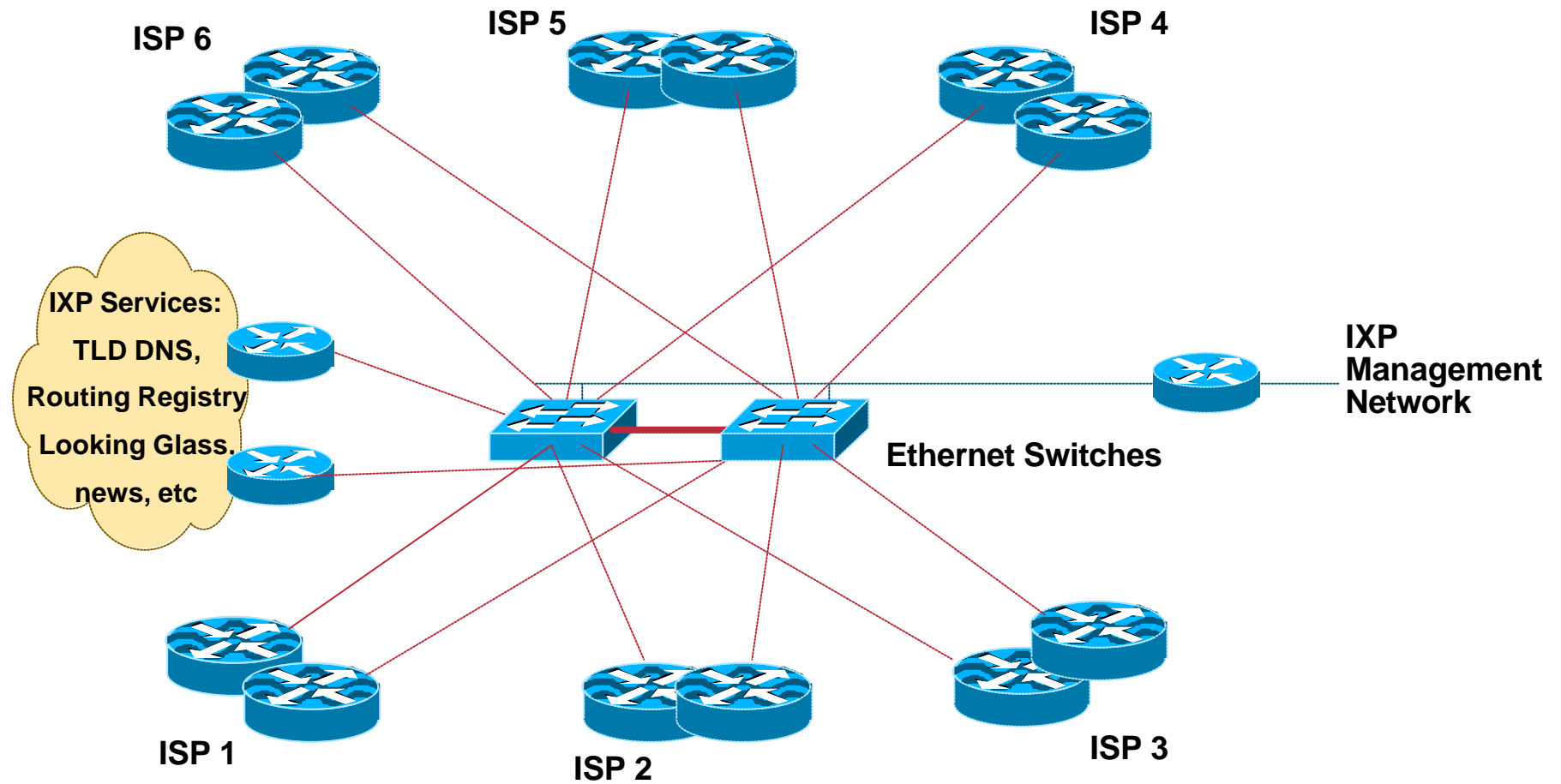
    router based

    central or distributed

Layer 2 Exchange

The traditional IXP

Layer 2 Exchange

ISP 6

ISP 5

ISP 4

IXP Services:

TLD DNS,

Routing Registry

Looking Glass,

news, etc

**IXP
Management
Network**

Ethernet Switch

ISP 1

ISP 2

ISP 3

Layer 2 Exchange

ISP 6

ISP 5

ISP 4

IXP Services:
TLD DNS,
Routing Registry
Looking Glass,
news, etc

IXP
Management
Network

Ethernet Switches

ISP 1

ISP 2

ISP 3

Layer 2 Exchange

- **Two switches for redundancy**

- **ISPs use dual routers for redundancy or loadsharing**

- **Offer services for the "common good"**

    Internet portals and search engines

    DNS TLD, News, NTP servers

    Routing Registry and Looking Glass

Layer 2 Exchange

- ## Requires neutral IXP management

    usually funded equally by IXP participants

    24x7 cover, support, value add services

- ## Secure and neutral location

- ## Configuration

    private address space if non-transit and no value add services

    ISPs require AS, basic IXP does not

Layer 2 Exchange

- ## Network Security Considerations

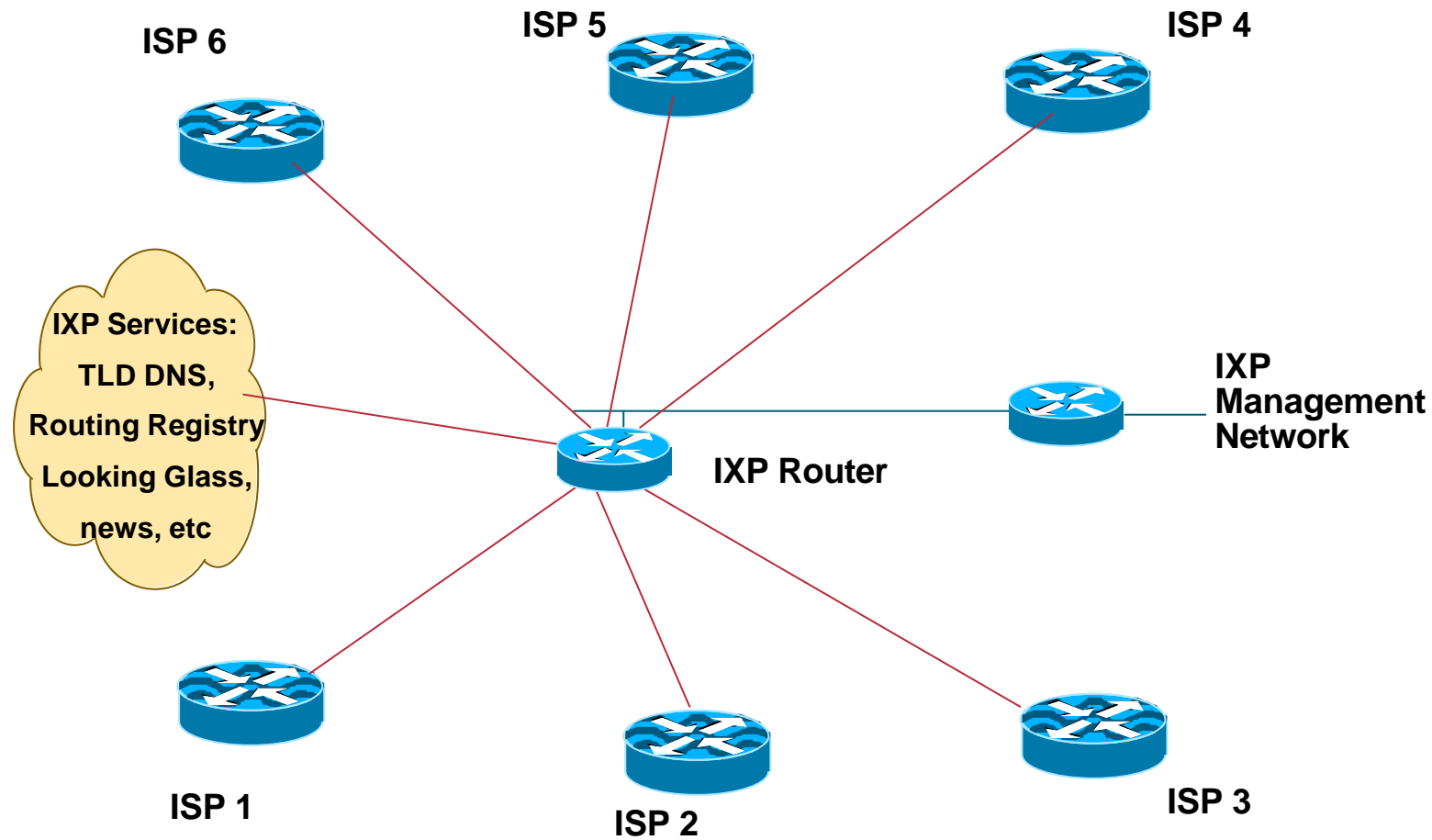   LAN switch needs to be securely configured

    Management routers require TACACS+ authentication, vty security

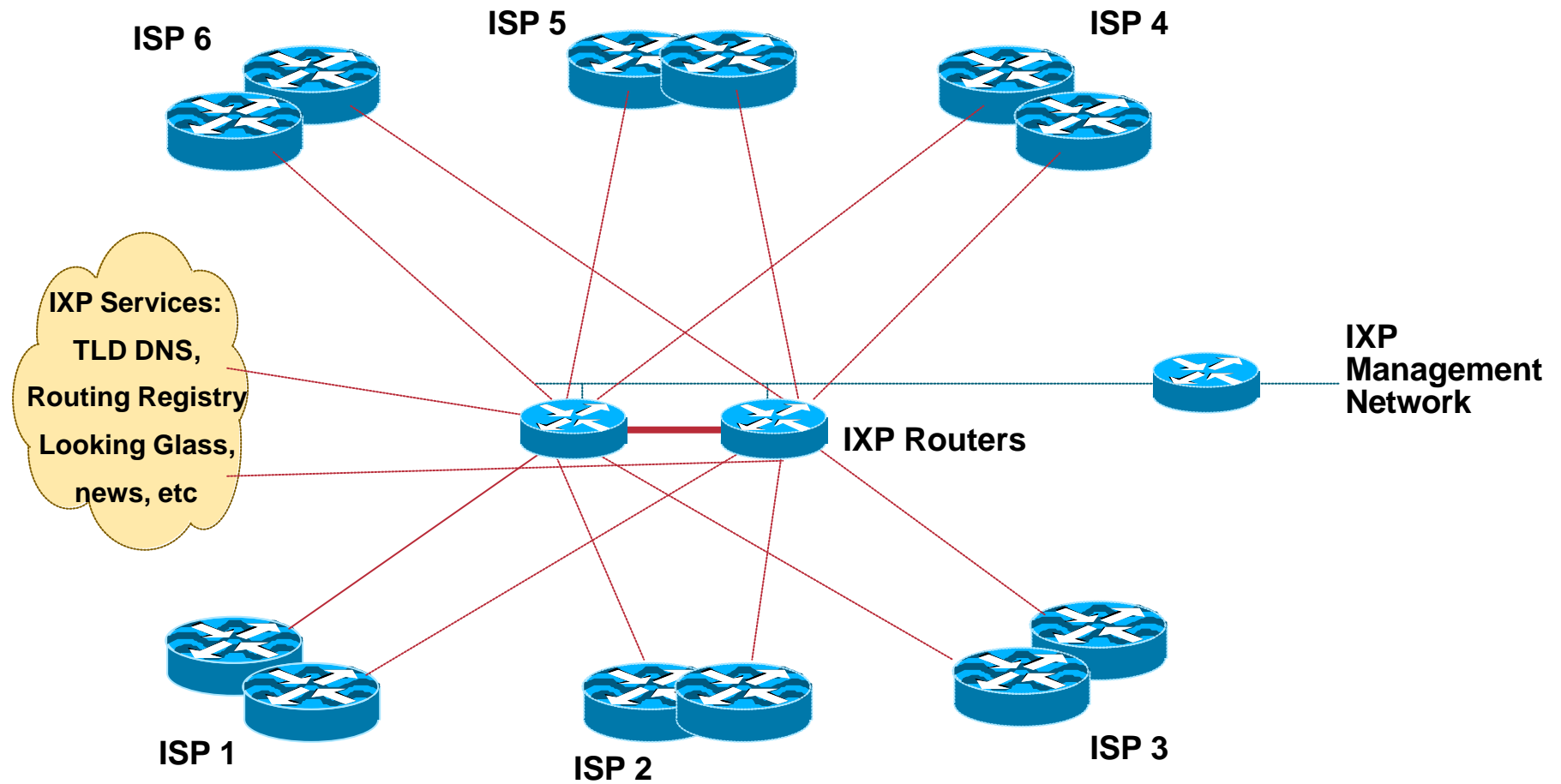   IXP services must be behind router(s) with strong filters

Layer 3 Exchange

The wholesale transit ISP

Layer 3 Exchange

ISP 6

ISP 5

ISP 4

IXP Services:
TLD DNS,
Routing Registry
Looking Glass,
news, etc

IXP Router

IXP
Management
Network

ISP 1

ISP 2

ISP 3

Layer 3 Exchange

ISP 6

ISP 5

ISP 4

IXP Services:
TLD DNS,
Routing Registry
Looking Glass,
news, etc

IXP
Management
Network

IXP Routers

ISP 1

ISP 2

ISP 3

Layer 3 Exchange

- **Two routers for redundancy**

- **ISPs use dual routers for redundancy or loadsharing**

- **Offer services for the "common good"**

    Internet portals and search engines

    DNS TLD, News, NTP servers

    Routing Registry and Looking Glass

Layer 3 Exchange

- **Requires neutral IXP management**

  usually funded equally by IXP participants

  24x7 cover, support, value add services

  BGP configuration skills essential

- **Secure and neutral location**

- **Configuration**

  private address space if non-transit and no value add services

  ISPs and IXP require AS

Layer 3 Exchange

- **Network Security Considerations**

    Core IXP router(s) require strong security, preferably with BGP neighbour authentication

    Management routers require TACACS+ authentication, vty security

    IXP services must be behind router(s) with strong filters

Layer 2 versus Layer 3

- ## Layer 3

    IXP team requires good BGP knowledge

    Rely on 3rd party for BGP configuration

    Less freedom on who peers with whom

    Could potentially compete with IXP membership

    Easier to distribute over wide area

Layer 2 versus Layer 3

- ## Layer 2

    IXP team does not need routing knowledge

    Easy to get started

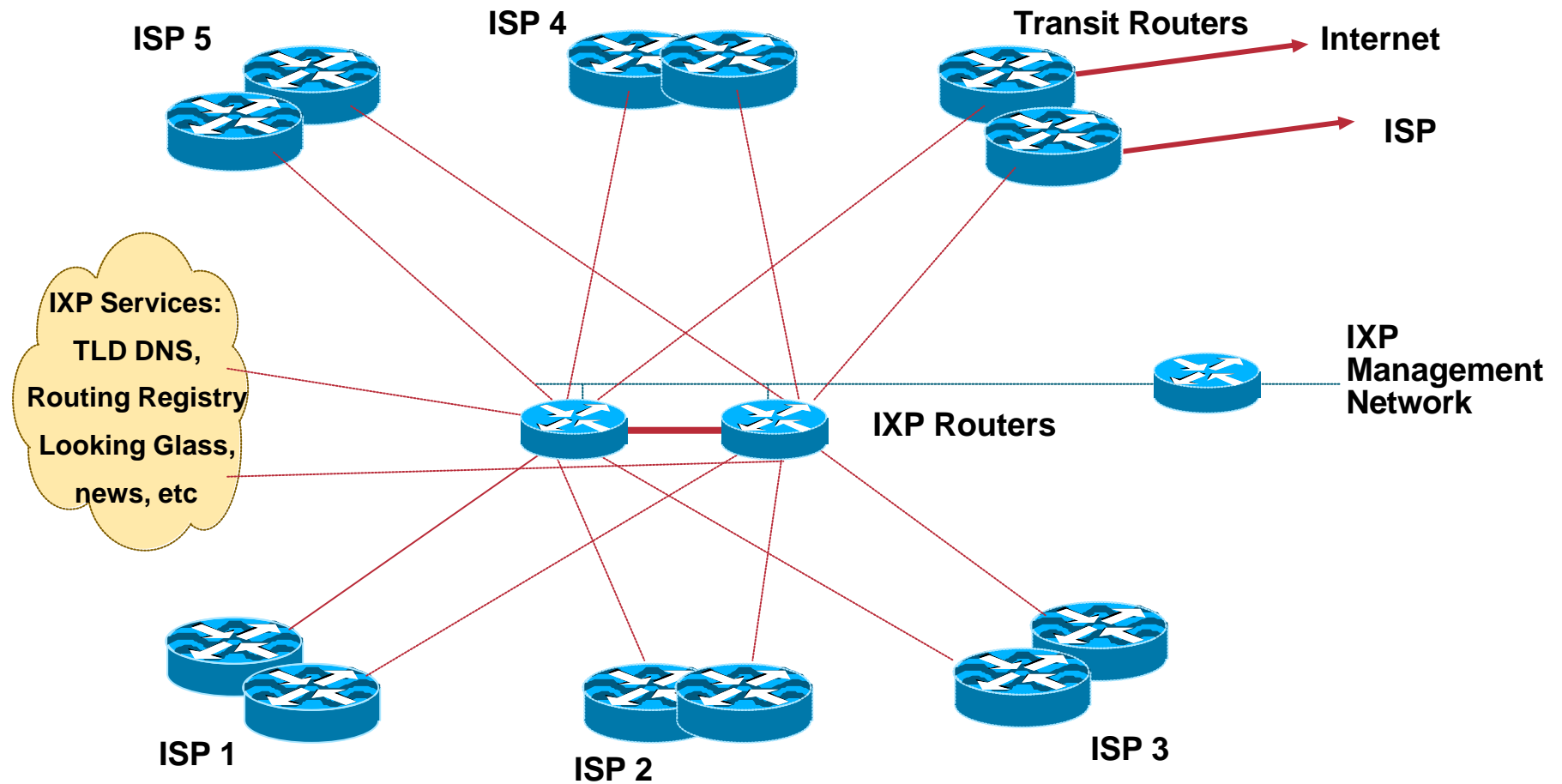   More complicated to distribute over wide area

    ISPs free to set up peering agreements with each other as they wish

Transit Exchanges

Transit IXPs

- **Provides local Internet exchange facility to members**

- **Also provides transit to Internet or upstream ISP**

- **Usually operated as a commercial service**

- **Usually layer 3 design**

Layer 3 Transit Exchange

ISP 5

ISP 4

Transit Routers

Internet

ISP

IXP Services:
TLD DNS,
Routing Registry
Looking Glass,
news, etc

IXP Routers

IXP
Management
Network

ISP 1

ISP 2

ISP 3

IXP Design Considerations

Routing and Address Space

- **ISP border routers should not be configured with default route or carry full Internet routing table**

- **Use private addresses if possible – public address space means IXP network could be leaked to Internet which may be undesirable**

Hardware

- ## Don't mix port speeds

   if 10Mbps and 100Mbps connections available, terminate on different switches (L2 IXP)

- ## Don't mix transports

   if terminating ATM PVCs and G/F/Ethernet, terminate on different devices

- ## Insist that IXP participants bring their own router

   moves buffering problem off the IXP

   security is responsibility of the ISP, not the IXP

Services Offered

- **Services offered should not compete with member ISPs (basic IXP)**

    e.g. web hosting at an IXP is a bad idea unless all members agree to it

- **IXP operations should make performance and throughput statistics available to members**

Services to Offer

- ## TLD DNS

    the country IXP could host the country's top level DNS

    e.g. "UK." TLD is hosted at LINX in London

- ## Usenet News

    Usenet News is high volume

    could save bandwidth to all IXP members

Services to Offer

- ## Route Collector

    All IXP members peer with the route collector

    Route collector shows the reachability information available at the exchange

    Requires a simple router with large memory

- ## Looking Glass

    one way of making the Route Collector routes available for global view

    public or members only access

Services to Offer
Route Server

- **Reduces admin burden on IXP member routers**

  only BGP session is with Route Server

  Route Server supplies all paths it knows to the IXP member routers – no best path selection

- **Can use private AS**

  Route Server software does not prepend its AS to the AS path

- **RSd (from Merit Network) commonly used**

Services to Offer

- **Network Time Protocol**

    Locate a stratum 1 time source (GPS receiver, atomic clock, etc) at IXP

- **Multicast**

    Provide MBONE and other multicast services for the common good

Services to Offer
Routing Registry

- **Routing Registry is used to register the routing policy of the IXP membership**

    documenting peering relationships

    auto-configuring of peer routers

- **Alternative is to use the public Internet Routing Registry (IRR)**

Cisco.com

IXP Design

Summary

Summary

- **L2 IXP – most commonly deployed**

  typically based around ethernet or ATM switches

- **L3 IXP – nowadays generally a marketing concept used by wholesale ISPs**

  doesn't offer the same flexibility as L2

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